

Elements of Student Success

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Preface

My aims in teaching include having my students be successful in their course work and encouraging them to practice active, confident, self-directed learning. To work towards these goals I employ a number of strategies learned during thirty years as a teacher.

The box to the right contains a list of some of the elements utilized in my teaching at Mohawk College. These are not listed in any order of perceived importance.

In Part 1 of this article (pages 2 to 5) is a description of each of the elements, explaining how and why each element is used. In Part 2 of the article (pages 6 and 7) is a brief personal memoir that details more fully how I came to know about and use these methods.

Key Elements of Student Success

- Modularization
- Frequent Evaluation
- Study Guide
- Implicit Learning Outcomes
- Individualization of Assignments and Exercises
- Repeat Testing
- Student Self-Pacing
- Multiple Versions of Quizzes and Tests
- Informal Learning Contracts

Introduction

During my second year of teaching chemistry at Dawson College (CEGEP) in Montreal, a colleague successfully introduced a fully individualized, non-lecture method of instruction (see Part 2). Subsequently, I was for four years one of a group of faculty teaching by that methodology at Dawson College. I became comfortable with the method and my students were very successful.

Since coming to Mohawk College in 1981 I have used a lecture-based teaching method, but have been able to add and integrate many of the key elements of individualized instruction into my teaching. My methods have been very well received and appreciated by students. This has been seen over many years at Mohawk College in informal feedback from students, through official College evaluations and through my own private evaluations.

Students have done well and have had positive feelings about their learning experience in my courses. I have seen many students gain confidence and practice self-directed learning.

Part 1: Promoting Student Success

Modularization

My course material is divided into many modules - small portions - both for learning and for evaluation. The material is broken down by topics and also by methods of evaluation.

Example: *Carboxylic Acids*, a 6 hour lecture / 4.5 hour laboratory topic in CHEM CH502 Organic Chemistry. This topic is evaluated in four portions:

- As a 15 minute closed-book *Naming Quiz*;
- As a 20 minute part of an open-book *Syntheses and Reactions Quiz*;
- As a 25 minute part of a closed-book *Test*;
- As one of the unknown samples to be identified in the *Laboratory*.

Modularization is a common theme in educational theory courses and at PD sessions on successful teaching strategies. At the Faculty of Education (U. of T.) in the Science classes it was presented as **KISS: Keep It Short and Simple**.

In a modularized course the material to be learned is broken down into small, manageable portions. Each portion is evaluated separately.

Frequent Evaluation

In my courses learning is evaluated and the students are given feedback on their progress as early and as frequently as possible. The evaluation is both formative¹ and summative².

I use as much evaluation as time allows, using many different methods of evaluation: short quizzes (closed-book); long quizzes (open-book); short tests; assignments; laboratory reports; longer tests. The **Appendix** on page 8 reproduces a course mark calculator for my course CHEM CH502 Organic Chemistry 2, showing how the course is broken down into portions for frequent evaluation.

Frequent and varied evaluation is another common theme in education. At the Faculty of Education (U. of T.) in the Science classes it was presented as **Vit(amin) K: Variety is the Key**.

Varied evaluation makes learning more interesting and allows students with different strengths to do well in at least some parts of a course. The more frequent the evaluation (short quizzes; short tests; assignments; laboratory reports; longer tests), the more likely it is that the evaluation will have a formative influence on learning.

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¹ Formative Evaluation: Evaluation that provides feedback to the students as part of their learning.

² Summative Evaluation: Evaluation that is used as part of the grading only.

Part 1: Promoting Student Success (Cont.)

Study Guide

In my courses a comprehensive study guide is given to the students in addition to a complete and up-to-date course outline. The study guide contains a detailed description of all of the course topics and requirements, and more.

Study Guide Contents:

- course outline;
- references and resources;
- testable terms and definitions;
- test questions;
- quiz guidelines;
- practice quizzes;
- assignment instructions;
- assignment mark schemes;
- course lecture schedule;
- evaluation format and schedule;
- course mark calculator.

Implicit Learning Outcomes

The **learning outcomes**³ communicated to my students are **implicit** rather than **explicit**. I give the students a course outline and a study guide with all of the materials suggested above rather than explicit learning outcomes.

The students are given a detailed course outline with all of the topics and sub-topics fully itemized and all of the references listed. They are given a comprehensive course study guide with detailed instructions for the material or task on every quiz, test, assignment or report. They are given **all of the definitions or terms and all of the questions which may appear on tests**, a practice version of every quiz and a detailed mark scheme for every report, assignment and laboratory report.

Pros and Cons for Using Implicit Learning Outcomes for Detailed Course Content

Pros

- Directly linked to course evaluation;
- In practice, very useful to guide student effort;
- No need to write detailed explicit learning outcomes;
- No need for students to interpret detailed explicit learning outcomes.

Cons

- Very detailed study guide required.

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³ It is assumed here that a Learning Outcome is identical to what used to be called a Behavioural Objective.

Part 1: Promoting Student Success (Cont.)***Individualization of Assignments and Exercises***

In my courses each student has individual numbers for all numerical assignments or laboratory questions. Each student has an individual topic for every assignment or laboratory question that is non-numerical in nature⁴.

Another common theme in education is: Keep the Student Active.

In my courses each student is expected to work actively on every possible aspect of the course material. My view is that this encourages the student to be personally active in response to the course material. In my courses group learning activities are neither encouraged nor discouraged. In other courses, group work may be very appropriate.

Giving individual numbers and topics reduces the possibility of copying or plagiarism.

Repeat Testing

In my courses the students are allowed to re-write any quiz or test in order to obtain at least a passing mark (60 %). Each of my students is encouraged to master every part of the course material at a pass level.

This requires the production of multiple versions of all course evaluation materials, as described later.

Allowing a student to re-write any quiz or test in order to obtain at least a passing mark is an idea derived from my experience with **Keller Plan (PSI)** learning, described in Part 2. In the PSI method, the **mastery** level for advancement is usually set at 80 or 90 %. Students have to keep re-writing to reach that level.

There are usually some students who find the availability of re-testing to a 60 % level to be either necessary for success, or very welcome to help reduce test anxiety.

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⁴ A summary of my individualization methods can be provided.

Part 1: Promoting Student Success (Cont.)

Student Self-Pacing

In my courses the students are given some control over the timing of their evaluation. A student may be allowed to complete the evaluation of the course at her / his own pace if necessary.

The availability of self-pacing is made possible by the use of individualized assignments and exercises, and also requires the production of multiple versions of all course evaluation materials, as described below.

A certain proportion of the students cannot complete the evaluation at the prescribed common pace, due to illness, personal or family problems, work pressures or other causes. For these students, self-pacing may be the best or the only way to complete the course requirements. For such students, this aspect of my course delivery is probably the most appreciated of all my methods.

Multiple Versions of Quizzes and Tests

Multiple versions of all course evaluation materials are required to allow for repeat testing and for student self-pacing.

Several methods are used to produce multiple versions of all of my quizzes and tests⁵. For my quizzes this is done by employing the merge operation of a word processor. For my tests multiple versions are produced using selected items taken from the published terms, definitions and test questions.

A side benefit of having multiple versions of quizzes and tests is a reduced necessity to use testing rooms when the class size reaches the limit of the assigned classroom. In such a case, two or three different versions of a quiz or a test may be used, negating any temptation for a student to glance at what the neighbours are doing.

Informal Learning Contracts

Explicit or formal learning contracts are used in education to give the learner options within a course. The learner may be given options as to how much material to cover, or different ways to achieve a desired grade. For example, some course material may be made optional, to obtain a higher grade. My students are given these options without having a formal written contract.

My students are given a detailed mark scheme for the course and a course mark calculator (see **Appendix** on page 8). Each person can then decide how to achieve the maximum mark that they desire or can manage in the course.

A common theme in education is that learners feel better and do better to the extent that they feel themselves to be in control of their own fate. When the evaluation of a course is made up of many components, the individual student has more ability to control what happens to them in the course. Students consistently tell me that this aspect of my course delivery is greatly appreciated.

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⁵ A summary of my methods for producing multiple versions of quizzes and tests can be provided.

Part 2: A Personal Memoir

My first teaching job was during a post-doctoral fellowship at Scarborough College (U. of T.) from 1971 to 1973. My duties included being the course director of a second year course in Analytical Chemistry. With no instruction as a teacher, my method for the lectures was the traditional 'chalk and talk' and for the evaluation it was big tests. Despite this, I enjoyed teaching more than doing chemical research.

In the Fall of 1973 I took a full-time teaching position at Dawson College (CEGEP) in Montreal, teaching in the Pre-University stream of the Quebec college English language system. At that time state of the art was an overhead projector and a ditto machine.

I was fortunate at Dawson College (1973 to 1980) and at Mohawk College (1981 to the present) and elsewhere to come to know many colleagues and others who were superbly good at one or another aspect of teaching, and from whom I learned much and borrowed with gratitude.

In 1974 my late colleague **Peter Berlow** at Dawson College introduced us to the **Keller Plan**. I was amazed that this non-lecture system actually worked extremely well. With a group of colleagues I was converted to PSI and did most of my teaching with the method for four years at Dawson College. Our group instructed other Dawson faculty in the use of the method by means of a PD session titled '**PSI by PSI**'.

Keller Plan Learning or PSI or Personalized System of Instruction

- No Lectures
- Modularized Instruction
- Study Guide
- Behavioral Objectives
- Mastery Learning
- Self-Paced

As my interest in teaching grew, I attended many conferences and seminars about teaching in general, and teaching science and chemistry in particular. I visited with teachers at their schools or colleges to learn about different models of instruction.

During a year of leave from Dawson College I completed a B. Ed. program (U. of T. 1978). The instructor for my major in Science and Specialist Chemistry at the Faculty of Education was **John Eix**. He taught us many useful techniques in his classes which I use today. There were some techniques or ideas I decided not to use with my students, notably multiple-choice testing and the use of explicit behavioural objectives.

The instructor for my minor in Physical Education was **Paul Rocks**, a secondary school teacher on a temporary secondment to the faculty. He taught me about other benefits of individualization and about the process of moving the learner from teacher-centered group activity towards student-centered individual activity.

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Part 2: A Personal Memoir (Cont.)

On returning to Dawson College, I completed some courses in a part-time M. Ed. program given by St. Michael's College of Vermont. For me, the most useful lessons came from a workshop course titled '**Individualizing Instruction**'. I later acted as the sole instructor for a much reduced PD version of this course given to other faculty of Dawson College.

From my time at Dawson College and at the Faculty of Education the ideas that have resonated with me for teaching are individualization, mastery learning, self-pacing, promotion of self-learning and ways to integrate the course evaluation tools as part of the learning package.

My belief is that clear definition of the learning tasks, and lots of formative evaluation and feedback are the keys to student success. This is where my effort is spent, rather than in the preparation and delivery of teacher-centered lectures.

In my teaching the main ideas of individualized instruction are applied: modularization; a study guide; mastery learning; self-pacing. Self-learning is encouraged by keeping the students active. All of the terms and definitions and questions which may be allowed on tests are published for study purposes, and the students also have practice quizzes to study. Student response to my methods has been very positive.

At Mohawk College I was greatly influenced by my former colleague **Phil Thomas**. He led me into the use of a Commodore C64 computer for word processing, and then into the use of an Apple Mac Plus for word processing, drawing, spreadsheets and data bases.

He taught me how to create assignments with individualized numbers by the use of a spreadsheet and a merge operation. This idea I have extended to the creation of individualized assignments and multiple versions of quizzes with text and graphic objects being merged rather than numbers.

My assignments and exercises are all fully or partially individualized. My numerous quizzes all exist in multiple versions. The production of the required materials is time consuming. Over the years I have learned to produce these materials in time efficient ways. Some of my methods of production have been adopted and adapted from other teachers; some methods I have developed myself.

Conclusion

I will be happy to provide examples of my materials or demonstrate my methods for producing individualized materials and multiple versions of quizzes.

Appendix

CHEM CH502 ORGANIC CHEMISTRY 2

DO IT YOURSELF FINAL MARK CALCULATOR (2005)

Use this calculator to determine your own grade in Course CHEM CH502

Laboratory (40 %)

Report ⁶	Full Marks	Your Mark
P	100	
AK	100	
CA	100	
A	100	
NC	100	
Mix	100	
NB	50	

Total = /600
= /40 %

Quizzes (17.5 %)

Quiz ⁷ No.	Full Marks	Your Mark
NQ1	20	
NQ2	20	
NQ3	20	
NQ4	20	
IRQ	25	
SRQ1	40	
SRQ2	40	

Total = /185
= /17.5 %

Final Mark (100 %)

	Full Marks	Your Mark
Lab	40 %	%
Tests	32.5 %	%
Quizzes	17.5 %	%
Ass'mts	10 %	%

Total = /100 %

Assignments (10 %)

Ass'mt No.	Full Marks	Your Mark
1	50	
2	100	
3	100	

Total = /250
= /10 %

Tests (32.5 %)

Test No.	Full Marks	Your Mark
1	30	
2	50	
3	45	

Total = /125
= /32.5 %

⁶ The Laboratory Course consists of a set of organic unknowns which must be identified: a Phenol; an Aldehyde/Ketone; a Carboxylic Acid; an Amine; an Aromatic Nitro Compound; a Mixture. There is also a Notebook mark.

⁷ The Quizzes are: Naming Quizzes; Infrared Quiz; Syntheses and Reactions Quizzes.